

The Research on the Path of Mixed Land Development Strategy in Settlements under the Low-carbon Background

Dong Shiyong ^{#1}, Ni Yazhou ^{*2}

Faculty of Architecture and Urban Planning, Chongqing University

¹99luxiao@163.com; ²398613897@qq.com

Abstract—In such a background of low-carbon, through the planning of settlements-related factors into account, this paper analysis the perspective of the land and the mixed-development land and the mixing factor of the plan, which can promote the settlement of low-carbon construction through the land-use new ideas.

Keywords—low-carbon settlements; mixed-development land; mixed planning; mixing factor; the strategies of development

I. INTRODUCTION

“China Urban Development Report (2009)” stressed that the low -carbon settlement is main carrier, as the core of the future nation-building where the practice of the main carrier of low -carbon, sustainable urban development in the 21st century, the ideal paradigm. Mixed development land is an effective way to achieve low-carbon settlements.

Jane Jacobs in "Death and Life of Great American Cities" said that "a complex and rich diversity of land use, makes each other whether in economic or in the community support each other continually." McHarg in the "Design with the Nature" said that "Any place is a historical, physical and biological development of the sum. These processes are dynamic, they formed a social value. Each region has adapted to a particular category of land use within the applicability, and finally, some of the region itself also is suitable for a variety of land use. "Shows a variety of land development, effective planning can be achieved under the guidance of complementary advantages.

Mixed-development land is an effective way to stimulate the vitality of the city, it attracted more and more attention, It is a response to the needs of modern urban development, it has a practical significance: A mixture of different land use bring the different architectural patterns, green space and configuration needs of public buildings, creating a rich space image, to create a rich visual effects, and further highlight the local characteristics; Mixed-development land can save land. By mixing in the same functional block, as well as space for high-composite, to achieve their inherent flexibility, maximize the effectiveness of land-poor; We combined the different space and function, which is conducive to the formation of multi-space form of integration, which is to help achieve economic, environmental and social benefits of unification; For planners and urban planning decision-makers cannot expect strict rules on the nature of land plots, proposed a more flexible planning ideas.

II. CONCEPTS AND ISSUES

A. Mountainous Low-carbon Settlements

As China's low-carbon settlements in the initial stage and the standards are not yet ripe, there is no unified concept. In general, low-carbon settlements' development goals is sustainable, it is based on ecological principles as a guide, it is the harmony between man and nature as a core, it is modern technology as a means to design and organize the residential space, both inside and outside resources and energy, its purpose is to recycle and be balance between internal and external settlements, its goal is to reduce consumption of natural resources and energy, and to make no pollution, no pollution, as living with local characteristics of high quality, high performance, high quality of life and culture' living space (see Table 1). The mountainous low-carbon settlements are designed to highlight a carrier of the mountain, the general slope of the terrain in more than 10%, which need to step and ramp handling road elevation relationship.^[1]

low-carbon settlements			
Minimum input		Efficient operation	Minimum output
type of land conservation	→	Composite function	→ resource recycling
type of energy saving	→	mixed-development land	→ lowest emissions

B. Mixing Factor of Mixed-development Land

Mixed-development land has often referred to some of the compatibility of land and space uses of the mixed state^[2]. Key factor in the mixed-development land is reflected in the various types of land area percentage share of the construction, which involves the mixing factor and the mixing degree. Mixing factor is the composition and the impact components of mixed-development land of settlements, and impacts the composition of ingredients. Mixing degree refers to the development of various functional components of buildings' occupied area ratio, reflecting the mix of functions that form factor of the relationship. Reasonable mixing degree of low-carbon settlements can be achieved, but also an inevitable trend of the settlements is a prerequisite.

[1] Wang Xiaojie, The research Low-carbon eco-residential construction and environmental management [D] Nanjing Agricultural University,2007

[2] Ling Li, The research of Mixed land use development pattern[J]

By the optimal combination of mixing factors, a reasonable configuration of mixing degree, can reduce the emissions of Low-carbon settlements significantly. Data shows that global energy consumption of real estate construction accounts for 40% of the terminal of the total global energy consumption. If improve the energy efficiency of settlements in 2010, the world can reduce emissions 715 million tons of Carbon dioxides, representing 27% of the estimated total global emissions.

C. Status of the Land Constitutes a Mixed Development

Low-carbon settlement is the ideal paradigm of modern urban construction. Its land is more diversified nature. Its function is more complex. From a single residential land to residential land-based which include public facilities, roads, square space, land and green space and other municipal facilities, etc? Above all, these create some natural conditions for the mixed-development land.

With the diversification of the nature of land, settlements' function and composition trend to be diversity. Mixed function of settlements can be commercial with residential, commercial with office, commercial with entertainment, residential with office, residential with some entertainment. Mixed function can be mixed throughout the settlements, one block can also be interspersed in the settlements, there may be a number of settlements inside the building (such as floor area for retail, office and residential upper) embellishment.

D. Mixed Development Land Problems

Achieved in a single block in the use of two or more functions and follow the principle of maximizing external effects. More performance for mixed-development is the residential and public service facilities, in particular a mixture of commercial facilities, and more in urban centers or large bus stations around, is clearly insufficient in internal settlements.

"Urban Residential Design Standards" in 2002 edition required that "settlements with the construction of facilities must correspond with the size of the population living in its construction of facilities with a total target area which can be arranged according to the form layout, flexible to use." "Chongqing residential facilities of public service standards report" supporting the settlements, which were divided into seven categories: performance, educational facilities, medical facilities, performance, cultural and sports facilities, commercial financial Posts and Telecommunications facilities, performance of community service facilities, municipal utilities performance and administrative facilities. These public service facilities of traditional settlements, are based primarily on "the targets of thousand people " and "service radius", and they stress the levels, their counterparts, supporting the combination of dispersion and concentration, but ignore the characteristics of urban development and the integration with the relevant planning , lack land and economic considerations, and the combination of land ownership boundaries. They do not meet the requirements of various types of facility layout, they are not a good compound with urban public open space system and the system of bus and walk, and they are difficult to combine the practical needs of life, they are lack of planning and controlling of rigid and flexible.

Under the current regulatory control in residential and commercial land cannot be achieved compatible categories, and "residential land" in the proportion of commercial is too small. To face the mixed mode, the local planning department responsible for the work proposed (mixing factor and mixing degree) is different: in the city of " Anhui Province Regulatory Planning Specification (DB34/T547--2005)" proposes four kind of mix land: a kind of mixed land (market and housing mixed), two kind of mixed land (work and housing mixed), three kind of mixed land (commercial and work mixed), four kind of mixed land (hotel and housing mixed); Regulatory Plan in Tongzhou proposed that, non-dominant features of the construction area of the total building area of 20% -40% can be identified as mixed land; In the " technical management Interim Provisions (2008) of the Regulatory Plan in Hefei ", there are two types of mixed land: one is a residential land for public buildings (public buildings of not less than 20%), the other is a mix of residential public buildings land use (residential no less than 20%)^[3]. The three local standards for the different mixed land classification, showing that the current mix of land planning and confusion of ideas is not clear.

III. ANALYSIS AND COUNTERMEASURES

A. Factors Affecting the Development of Mixed Land

The mixed-development land of Low-carbon settlements are influenced by the superior plan, position condition, and market factor and so on:

Settlements to its location directly affect the mixed land use pattern and mixing degree. Developed in a different location is affected by the land value, traffic conditions and other related articles provided. Planning decisions directly affect the upper or mixed land use pattern of settlements.

Such as settlements near the center of public activity, they will certainly avoid some of the mixed-mode function similar with the surrounding public facilities; Such as the settlements near the commercial center, the settlements within them must be appropriate to reduce the commercial scale; Such as close to the municipal school, the school within the residential places serve mainly domestic. In general, the closer to urban centers or regional centers, such settlements projects produce high returns.

Markets tendency directly affect the target population of settlements and product positioning. In order to maximize the benefits, this is bound to adopt the appropriate measures, different in the configuration or the functional diversity and flexibility.

B. Response to Mixed Land Development 1

1) Horizontal of Mixing Land Development:

Horizontal mixed-use is mainly to achieve short-distance travel of residents, including two aspects: First, through mixed residential and employment land development, housing and employment in the space can be achieved equilibrium (see

[3] Zhu Changyou, The research of mixed used land in the Regulatory Plan[J] Theoretical science, 2009

Figure 1); Second, it is through the living and public service facilities moderately mixed in their daily lives, to achieve short-distance travel, such as children to school, the elderly health, daily shopping, entertainment, leisure and other local solutions. Mixed-development land can reach a balanced distribution between jobs and public services reduce the pendulum traffic and pollution caused by energy consumption, use the public services more effectively.

2) Vertical of Mixing Land Development:

Vertical mixed-use is mainly based on mountainous terrain and modern high-rise, high-rise residential and underground space: Through using public buildings' open space and the level of scattered terrain, to build the public space which is inter-related. Within the scope of its main nodes interconnected in order to form an internal continuous, open air, walking the line of sight system as a whole; Combined with the terrain of the underground space development and utilization of construction, including all kinds of business, entertainment, restaurants, stadiums, underground parking and other space systems; Taking advantage of the high errand and connecting with the ground the roof platform, and building platform, landscaping, leisure and sports facilities in order to combine the upper and lower space system; Using for commercial and residential in high-rise residential meet the requirements of vertical development. Through the terrain and a variety of storey buildings and the use of underground space, to form the multi-dimensional complex mixed use land development system.

C. Response to Mixed Land Development 2

1) The Location of Settlements and Land Use Integration

Location of settlements and land use integration is actually reverse reasoning from the location of settlements factors. It is achieved by identify the impact factor of location aspects, to guide settlements through analyzing influencing factors of settlements of low-carbon targets. To overcome the negative effects which is brought about by the external.

2) Level-1 Heading: the size of settlements and land use integration

American scholars proposed that "public transport settlements" such a concept. This is not only that the combination of public transportation and settlements. It is more emphasis on the size of the settlements the impact of energy use. It emphasizes the person comfortable walking distance of the size of land under the land under the mixed development.

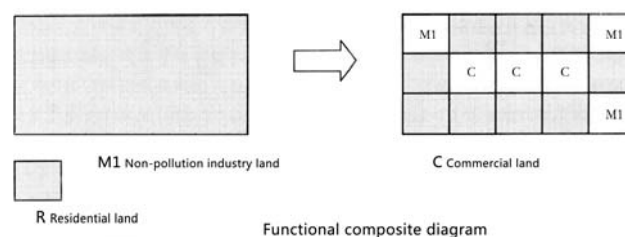
For example, in fast major stations connection lines on both sides of urban and suburban, away from the site within a radius of 500 m arrange in high density residential areas, away from the site 500-1000 meters radius arrange in medium density residential areas, to 1 km radius from the site as the basic unit of urban settlements^[4]. Typically, people comfortable walking distances are in 300-500 meters, from it we can estimate the size of land moderate size for settlements which should be between 9-16 hectares.

Using a "short-path and mixed-function layout mode" for the relatively modest size of the settlements. Through settlements, public service facilities layouting with large public buildings, it can be achieved functional diversity and distribution of multi-level nature.

If the scale of settlements is relatively large, we can use "Settlements small cycles traffic pattern." To the size of the settlements within the repeating cycle, we can use small electric buses, electric cars which can be formed their own settlements small cycles of "mini-matrix." In the "mini-matrix" region arranges public service facilities.

3) External integration of transport and land use

According to Cambridge Systematic' research, in 1992, shows that high-density, based on public transport development of settlements falls 20-25% than the relatively low-density and based on car traffic 'settlements.

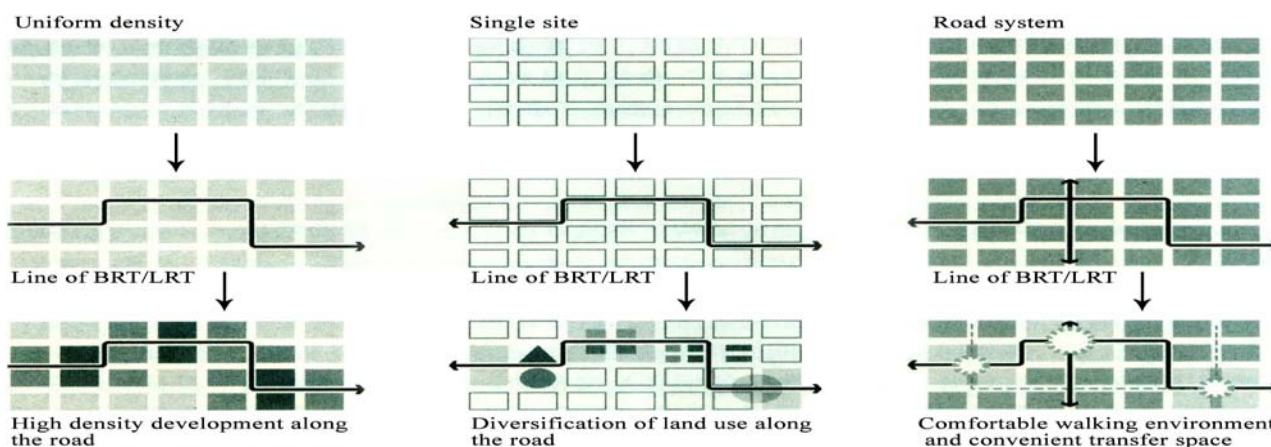


By public transport hubs and the integration of land use, including work, shopping, entertainment, education, leisure as well as commercial, office and other functions should be arranged with the integration of public transport hub, effectively reduce the private motor vehicle traffic generated of the housing area, thereby effectively reducing the transport energy consumption.

Low-carbon transportation planning follow the 3D principles (see Figure 2): Density: refers to the area around the station to be a higher density development in order to increase the use of public transport systems; Diversity: refers to the mixing of land development, improve the surrounding areas of station land use of convenience; Design: a pedestrian-oriented design principles, create a comfortable space for walking and public transport interchange environment, and strengthen cooperation with other transport connection with the transfer and to increase the willingness of people to use public transport.

Thus, the transport capacity and accessibility can be used to estimate the intensity of land development and open space and the distribution of public facilities. According to the road level of the settlements inside and outside to determine the intensity of land development, according to intensity of land development to determine the distribution of settlements, population density and open space and public service facilities of efficiency. Extension of the city bus within a certain range around the nodes, high-density development, mixed layout of functions, and in a range outside the sub-region but also for lower density development, the formation of mixed land use and residential density, in turn decreasing the degree of spatial structure. The use of land use and transport integration and encourage the mixed-development land. When we have a plan about the overall urban planning, we should consider the bus

[4]Xu Anzhi, The Next Chinese Suburban: Compact Residential Developments Surrounding Stations of Express Transport Line



line which is the center for all land use and development of density district. Two blocks near the bus lines are encouraged high-density development, strictly, two blocks away from the bus lines, which are limited the supply of land in order to form mixed about high-density and low-density. High-density mixed land use planning and existing transportation corridor planning are our development model.

IV. THINKING AND PROSPECTS

The research on the development strategies of the mountainous low-carbon settlements has great significance. However, due to our low-carbon also is in the initial stage, the mixed development land does not have enough knowledge, so in the planning and construction may occur various problems and bottlenecks, which should be thinking and outlook:

A. In the Planning Technical Level to Improve Planning Control System

Now that settlement construction is primarily based on the existing general rules, control rules defined by the nature of land, building density, plot ratio and related technologies based on the indicators, control rules are too rigid to develop indicators. Land use patterns are too simple, what's more, developers' economic interest-oriented and so on, there are so many difficulties in the construction of low-carbon settlements. Therefore, according to the specific situation of our country, we should improve our planning and control system. First, to strengthen the quantitative research of planning process for the mixed land use, then, to determine the mixing degree, form an effective means of mixed land use and planning control; Second, modify the urban construction land classification standards, to meet the needs of mixed development land, to protect the public interest of land development, establishing a market demand for land classification, introducing "mixed-use land" type, setting mixing planning as a special planning and mixed-development land for different priority, develop the settlements of compact, diverse, green, safe, pleasant and dynamic.

B. Sustainability of Planning and Management

In the aspect of planning and management, governments must make policy support the patterns of mixed-development in settlements, including city funds, commercial sponsorship, the development of land compensation and the relevant regulations of development etc. The most important thing is to

establish a new management system and ensure that public commitment, even after the change of government can be elected by the follow local officials.

C. Expansion of Planning Technology and Management Level

Modify the classification of urban construction land and increase the new mixed-use land type; these must have a special plan to match it - mixed planning which should strengthen the further research. Meanwhile, enhance the effectiveness of planning science and the importance of technical support, establish and implement more flexible set of management guide policy, and make the control of planning and development policies be more flexible and effective.

V. CONCLUSION

Low-carbon settlements related to many aspects of construction, land development is just one of a mixture. It has to use a mixture of development to achieve low-carbon settlements or settlements of low-carbon optimized to achieve, but also requires constant exploration and development.

ACKNOWLEDGEMENT

This paper was funded by Key Laboratory of Subtropical Building open issues - "mountain city overall mechanism and method" (No. 2009KA01).

REFERENCES

- [1] Wang Xiaojie, The research Low-carbon eco-residential construction and environmental management [D] Nanjing Agricultural University, 2007.
- [2] Xu Anzhi, The Next Chinese Suburban: Compact Residential Developments Surrounding Stations of Express Transport Line [J], 2002.
- [3] Zhuo Gang, Construction of settlements under the Perspective of low-carbon framework [J] Residential Technology.
- [4] Wang Yongzheng, Urban settlements public transport and land use under energy context [J], 2006.
- [5] Ling Li, The research of Mixed land use development pattern [J].
- [6] Huang Guangyu, Mountain city branch of learning [M] China Building Industry Press, 2002.
- [7] The Urban Land Institute. Mixed-use Development: New ways of Land use [M], 1976.
- [8] Nancy A Miller and Research Associate Defining Mixed-use Development.
- [9] COLORADO MIXED-USE ZONING&STEET STANDARDS, December 2001.